

Vegetation and Fuels



Developing a Fuel Model for *Baccharis* (Coyote brush)

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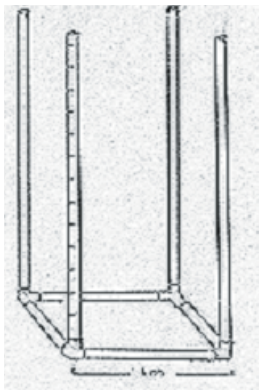
GOLDEN GATE NATIONAL REcreation Area and Point Reyes National Seashore are linked by contiguous vegetation and share an extensive wildland-urban interface. Efforts are currently underway to complete mapping and classification of vegetation within the two parks. Quantitative vegetation data is critical for fire management in order to manage fuels, protect communities and accomplish other resource management objectives. Once the vegetation data set is compiled, the parks will translate the vegetation data into fuel load information.

Accurate fuel load data is essential to fire management planning. Brown’s transects , a standard method for assessing fuels, are used to quantify dead and down fuels in forest vegetation types. Crown fuels in forest types are typically modeled with crown bulk density measures. Biomass clipping and weighing is widely recognized as an accurate method to assess fuel loading in grassland ecosystems. Currently, however, there are no accepted quantitative methods for assessing fuel loading in shrub vegetation types which are very common at Golden Gate and Point Reyes.

The coyote brush (*Baccharis pilularis*) fuel modeling project will address this knowledge gap on a local level by establishing field methods for assessing live fuel loading in shrub-dominated habitats. This study aims to develop a simple model based on a relatively consistent vegetation type. If these methods can be used effectively on a simple model, they will provide the foundation for developing models in more complex vegetation types.

The project will compare the accuracy and efficiency of three indirect methods for estimating live fuels in coyote brush shrub

types. The three indirect methods are hemispherical imagery (also known as leaf area index), basal stem diameter measurements, and height estimates. These indirect methods will be compared with a single direct method that will serve as a baseline, and is the most accurate estimate of biomass.

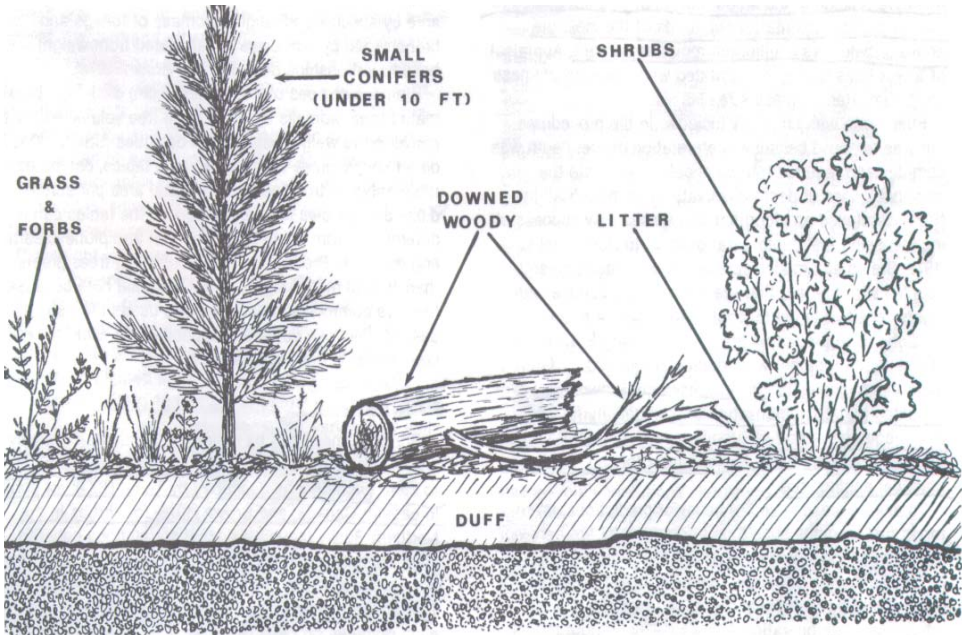


The direct method, known as “destructive” biomass sampling, involves complete removal and measurement of a quantified area of shrub. Data from the three indirect methods will be compared to determine which one provides the best correlation with the destructively collected biomass samples.

The study area is subdivided into two distinct ecological types of coyote brush: 1) early-successional coyote brush-dominated scrub on the Point Reyes peninsula; and 2) the coyote brush-dominated coastal sage scrub in the Marin Headlands.

Forty-five plots will be randomly sampled in each ecological type, for a total of 90 plots across the study area. The data will be analyzed for differences both between and within the two types.

In addition to comparing the three indirect methods of quantifying biomass in the coyote brush shrub type, data on fuel composition and structure will also be collected. The destructive biomass samples will be processed to determine the amount of biomass that is living and dead, and to categorize these fuels into size classes



Vegetative components included for estimating biomass and fuel loading. From USDA General Technical Report INT-129, August 1982. (Brown, Oberheu, and Johnston)

Fuels Terminology

Biomass - weight of material derived from a living organism

Brown’s transects - standard field collection methods used tp determine weight per unit area of living and dead surface vegetation (duff, litter, and downed woody)

BTU - British Thermal Unit; the quantity of heat required to raise the temperature of one pound of water by one degree Farenheit; these units are often used to describe the potential energy of wildland fuels (BTUs / acre)

Crown bulk density - mass per unit volume of combustible upper tree biomass, including leaves, twigs and branches

Downed woody - dead twigs, branches, stems, trunks and boles of trees and shrubs that have fallen and lie on the ground

Duff - partially decomposed vegetative material lying below the freshly fallen litter and above the mineral soil

Fuel loading - the total amount of fuel present in an environment, described quantitatively as weight of fuel per unit area

Fuel type & fuel model - fuel elements of particular plant species, form, size, or arrangement (fuel type) that will cause a predictable rate of fire spread under specified weather conditions (fuel model)

Hazardous fuels - any live or dead vegetation which poses a fire hazard, threatening life or property

Hemispherical imagery - technique using a bowl-shaped tool to measure light underneath a plant in order to determine plant biomass based on the amount of light blocked by the plant

Litter - freshly fallen leaves, needles, fruits, dead matted grass, and other non-woody vegetative parts that have not been structurally altered by decomposition.

Mineral Soil - soil layers below the predominantly organic horizons which have little combustible material; generally refers to the “bare soil” below the litter and duff

MEASURING FUEL

Biomass is collected in the field and bagged according to layers defined by height and whether it is live or dead.



Live and dead biomass for each layer is sorted into six fuel size classes.



All processed biomass is then dried at 105° C and weighed to the nearest gram.



established in fire science literature. The fuel data will then be stratified by height to analyze the vertical structure of fuels. These measures will provide a baseline for building a custom fuel model specific to the coyote brush shrub type, which will enable fire managers to accurately estimate fuel loading and model fire behavior. This, in turn, provides quantified fuels data and accurate model predictions for site specific vegetation types, essential to risk assessment, fuels treatment, fire management and fire planning in Golden Gate National Recreation Area and Point Reyes National Seashore.

VALUES -Coyote brush provides sheltered nesting, and important seed and insect food sources for wildlife species such as Nuttall’s White-crowned Sparrow which is dependent on coastal scrub. Coastal scrub habitat, dominated by coyote brush, has been reduced by human development. Fire suppression has also led to the encroachment of Douglas fir into coastal scrub, reducing it further.